

APPENDIX G

WATER QUALITY DATA COLLECTION, ANALYSIS AND MANAGEMENT

Three separate items are discussed in this appendix: 1) what data sources are used, what kinds of data are used; 2) how does new data enter and move through the water quality assessment process, how is data stored and retrieved; and 3) what guidelines or rules does DNR follow to determine impairment from water quality data.

SOURCES AND KINDS OF DATA USED

Table G-1, Data Used in Compilation of 1998 Water Quality Assessment (305b, 303d)

Source	Data Type	Data Quality Level
- Citizen complaints	Letters, phone calls	Indicator
- DNR, MDC staff	Quick visual survey	Indicator
- DNR Facility/Complaint Investigation	Written report, may include some water chemical sampling	Indicator
- Volunteer Water Quality Monitoring, (QAQC Level 1)	Visual, Water Chemistry, Qual. Benthos	Indicator
- Volunteer Water Quality Monitoring (QAQC Level 2-3)	Visual, Water Chemistry	One
- DNR Water Pollution Program staff	Qual. Benthos	
- DNR Water Pollution Program staff	Visual, Water Chemistry	One
- NPDES Permit Holders Required Instream Monitoring	Qual. Benthos	
- NPDES Permit Holders Required Instream Monitoring	Chemical	One
- NRCS Watershed Project Monitoring	Chemical	One
- DNR Laboratory and Water Pollution Program staff	Intensive Studies (many samples in a short time period to document an impact in a specific area)	Two
- NPDES Permit Holders Required Toxicity testing of Effluents	Chemical	
- NPDES Permit Holders Required Toxicity testing of Receiving Waters	Quantitative Benthos	
- EPA Toxicity testing of Effluents	2 Species Bioassay Test	Two
- EPA Toxicity testing of Receiving Waters	2 Species Bioassay Test	Three
- USGS/DNR Cooperative Fixed Station WQ Monitoring Network and NASQAN Network	2 Species Bioassay Test	Two
- USGS NAWQA Monitoring Program	Chemical	Two-Three*
- US Army Corps of Engineers	Surface and Groundwater Chem.	Two
- US Park Service/USGS Monitoring	Benthic or Fish Community	Three
	Chemical	Two
	Chemical	Two

Source	Data Type	Data Quality Level
- City of Kansas City, Mo.	Chemical	Two
- St. Louis County Water Company	Chemical	Three
- Springfield Public Utilities	Chemical	Two
	Quantitative Benthos	Three
- Springfield Dept. of Public Works	Chemical	Two
- DNR/Crowder College Monitoring	Chemical	Two
- DNR/Univ. of Missouri/Volunteer "Lakes of Missouri Monitoring	Chemical	Two
- Kansas Dept. of Health and Envir.	Chemical	Two-Three*
- Iowa Dept. of Envir. Quality	Chemical	Two
- Arkansas Dept. of Pollution Control	Chemical	Two
- Special Research Projects by Federal Agencies (USGS-WRD and USGS -BRD)	Chemical	Two
	Quantitative Biological	Three
- DNR Hazardous Waste Program	Chemical	One
- DNR Land Reclamation Program	Chemical	Two
- DNR Public Drinking Water Program	Chemical	Two-Three*
- Mo. Dept. of Conservation	Quantitative Biological	Three
- Novartis Corporation	Chemical	Two
- DNR/USEPA	Whole Fish Tissue Chemistry	Two
- Mo. Dept. of Conservation	Fish Fillet Tissue Chemistry	Two

Other sources often used but not used for the 1997-98 assessment

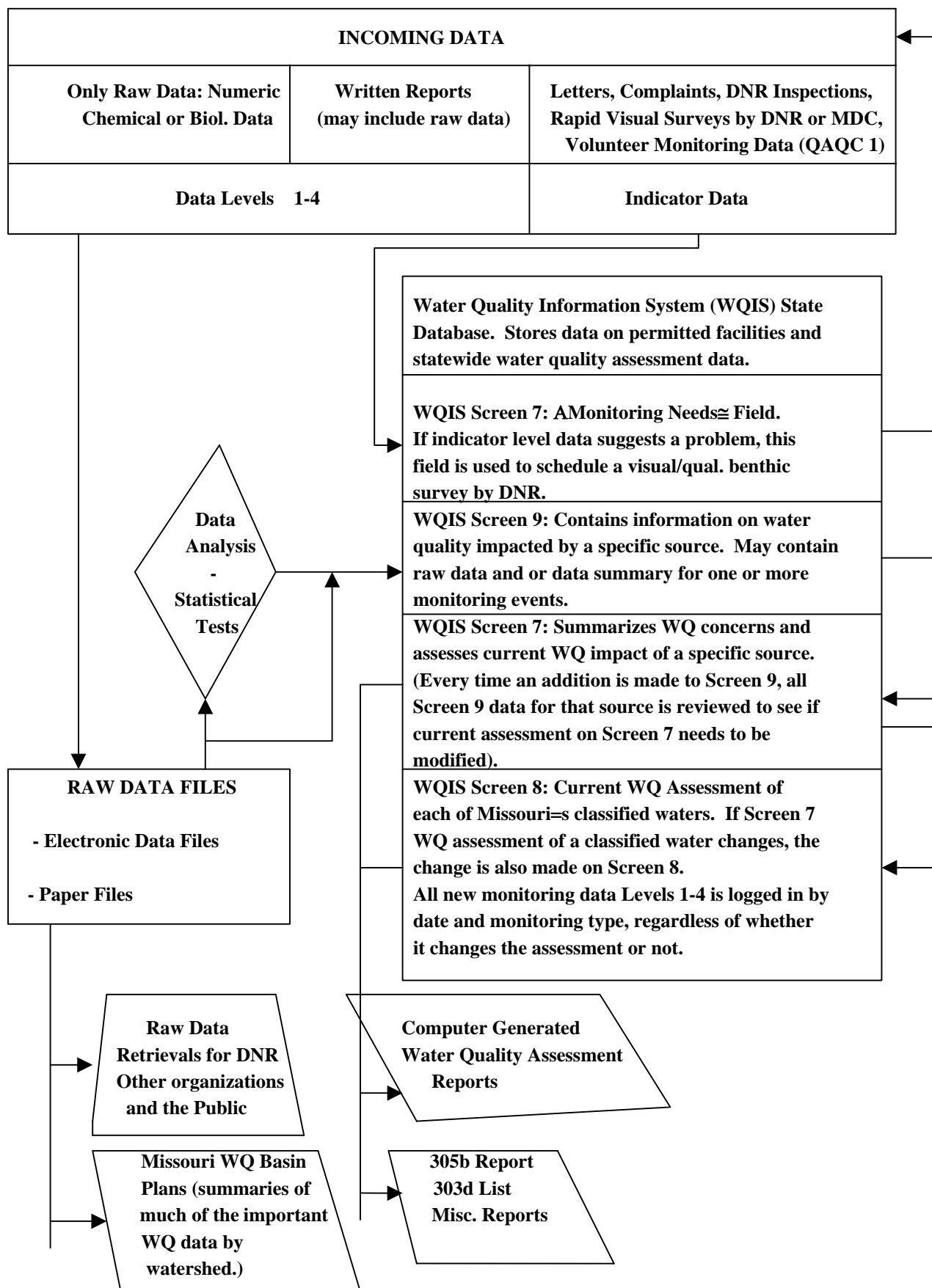
St. Louis City Water Co., Metropolitan Sewer District of St. Louis and Graduate Research Theses.

* Large data sets extending over many years are rated at level three, smaller data sets and data sets with short periods of record are rated level two.

Note: No Level Four data (quantitative sampling of two or more of the major aquatic biota, i.e., fish, aquatic macroinvertebrates or algae) was available for this assessment.

WATER QUALITY DATA FLOW AND DATA MANAGEMENT PROCESS

The following flow chart shows how new data flows into the DNR water quality data management system and is used to update a water quality assessments that result in such products as the biennial state water quality report (305b report) and the biennial Section 303(d) list.



- (1) Electronic data files include:
- Water chemistry of many rivers in Missouri
 - Water chemistry of over 100 lakes in the state
 - Bacterial levels in recreational waters at state parks
 - Water chemistry of large springs
 - Summary of statewide fish kill data
 - Pesticides in surface waters
 - Pesticides in ground waters
 - Pesticides, PCBs and heavy metals in fish tissue
 - Results of Toxicity Testing of wastewaters and streams
- (2) Paper files include:
- Raw data sheets
 - Published reports, entire or relevant portions
 - Unpublished reports, inspections and water quality studies
 - Graduate research theses

GUIDELINES FOR DETERMINE WATER QUALITY IMPAIRMENT

BENEFICIAL USES	DATA TYPE	DATA QUALITY CODE*	COMPLIANCE WITH WATER QUALITY STANDARDS
Overall use protection	No data--evaluated based on similar land use/ geology as stream with water quality data.		Given same rating as monitored stream with same land use and geology.
	Visual observation of stream and qualitative evaluation of aquatic macroinvertebrates.	1	<p><u>Full</u>: Stream appearance and aquatic invertebrates typical of reference streams in this region of the state.</p> <p><u>Partial</u>: Odor, turbidity, objectionable, suspended matter or bottom deposits that would interfere with beneficial uses or reduced diversity of aquatic macroinvertebrates.</p> <p><u>Non-Attainment</u>: Odor, turbidity, or objectionable suspended matter bottom deposits severe enough to prohibit beneficial use or only pollution tolerant aquatic invertebrates found.</p>
Protection of Aquatic Life	Chemical (toxics)	1-2	<p><u>Full</u>: No more than 1 exceedence of acute criterion in 3 years; less than 10% of all samples exceed chronic criterion.</p> <p><u>Partial</u>: More than 1 exceedence of acute criterion in 3 years; less than 10% of all</p>

BENEFICIAL USES	DATA TYPE	DATA QUALITY CODE*	COMPLIANCE WITH WATER QUALITY STANDARDS
			<p>samples exceed chronic criterion.</p> <p><u>Non-Attainment</u>: More than 10% of all samples exceed chronic criterion.</p>
	Chemical (conventional)	1-2	<p><u>Full</u>: Less than 10% of all samples exceed criterion.</p> <p><u>Partial</u>: 10-25% of all samples exceed criterion.</p> <p><u>Non-Attainment</u>: More than 25% of all samples exceed criterion.</p>
	Biological	3	<p><u>Full</u>: Fauna very similar to regional reference streams.</p> <p><u>Partial</u>: Diversity or number of intolerant taxa slightly to moderately less than reference streams.</p> <p><u>Non-Attainment</u>: Diversity or number of intolerant taxa much less than reference stream.</p>
	Toxicity testing of effluent	2	<p><u>Full</u>: No statistically significant mortality in either of two tests species at the AEC*** or the AEC must be less than 30% of the LC₅₀** for both test species.</p> <p><u>Non-Attainment</u>: Conditions for full attainment not met.</p>
	Toxicity testing of streams or lakes	3	<p><u>Full</u>: No statistically significant deviation from controls in chronic test endpoints in at least two representative species.</p> <p><u>Non-Attainment</u>: Statistically significant mortality in at least one of two representative test species.</p>
Fish Consumption	Chemicals (water) Chemicals (tissue)	1-2	<p><u>Full</u>: Water quality criteria not exceeded as a long-term average; fish consumption advisories allow typical or average fish consumption rates for all commonly eaten species.</p> <p><u>Partial</u>: Fish consumption advisories allow less than typical or average consumption rate for at least one commonly eaten species.</p> <p><u>Non-Attainment</u>: Water quality criteria exceeded as long-term average or consumption banned for at least one commonly eaten species.</p>
Drinking Water	Physical, chemical (nutrients)	1-2	<p><u>Full</u>: Very little loss of lake volume due to sedimentation, low levels of nutrients, no history of taste or odor problems due to</p>

BENEFICIAL USES	DATA TYPE	DATA QUALITY CODE*	COMPLIANCE WITH WATER QUALITY STANDARDS
Supply			algae. <u>Threatened</u> : Rate of sedimentation moderate and no taste and odor problems known but nutrient or algae levels similar to lakes with taste and odor problems. <u>Partial</u> : Water supply may be inadequate in dry years due to loss of volume to sedimentation or supply has infrequent taste and odor problems. <u>Non-Attainment</u> : Water supply has chronic water shortage due to loss of storage volume to sedimentation or frequent taste and odor problems or supply causes infrequent gastrointestinal problems in users.
	Chemical (toxics, raw water)	1-2	<u>Full</u> : Mean values do not exceed criterion or Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs). <u>Threatened</u> : Chemical use patterns in watershed are similar to watersheds with non-attainment. <u>Non-Attainment</u> : One or more contaminants have mean values in excess of water quality criteria or SDWA MCLs.
	Chemical (Iron, Manganese, Total Dissolved Solids, Raw Water)	1-2	<u>Full</u> : Mean values do not exceed criterion. <u>Threatened</u> : Mean values do not exceed criterion but time trends suggest mean may be exceeded in future. <u>Non-Attainment</u> : Mean values exceed criterion.
	Chemical (toxics, finished water)	1-2	<u>Full</u> : No MCLs or Water Quality Standards criteria exceeded or significant taste and odor problems using only convention treatment (sedimentation-disinfection). <u>Threatened</u> : Chemical use patterns in watershed are similar to watersheds not in full attainment. <u>Partial</u> : Additional treatment needed to meet MCLs or Water Quality Standards criterion. <u>Non-Attainment</u> : At least one contaminant has annual average exceeding MCL or Water Quality Standards criterion or supply has been closed during the past 2

BENEFICIAL USES	DATA TYPE	DATA QUALITY CODE*	COMPLIANCE WITH WATER QUALITY STANDARDS
			<p>years due to contamination of raw water entering the plant.</p> <p>NOTE: water quality problems caused by the drinking water treatment process such as the formation of Trihalomethanes (THMs) are not included.</p>
Whole-Body-Contact Recreation	Fecal Coliform count	1-2	<p><u>Full</u>: Water Quality Standards not exceeded as a geometric mean for samples collected during the recreation season and at times not influenced by storm water flows.</p> <p><u>Non-Attainment</u>: Geometric mean does exceed Water Quality Standard criterion during recreation season at times not influenced by storm water flows.</p>
Irrigation, Livestock and Wildlife Water	Chemical (boron, cobalt)	1-2	<p><u>Full</u>: Mean value does not exceed water quality criteria.</p> <p><u>Non-Attainment</u>: Mean value does exceed water quality criteria.</p>

* Data quality codes have been established by EPA to rate the quality and quantity of data from a specific source. Level one data is the lowest level of useable data and includes infrequent chemical monitoring or qualitative biological monitoring. Level Two data would include intensive water chemistry studies, long-term water chemistry monitoring sites and fish tissue analysis. Levels Three and Four are for detailed biological studies of fish, aquatic invertebrates and toxicity testing of waters.

** LC₅₀ The concentration of a contaminant that kills 50% of test organisms.

*** AEC = Acceptable Effluent Concentration. This is the percentage of effluent in a solution of effluent at the effluent design (max.) Flow mixed with 2.5% of the 7Q₁₀ low flow of the receiving stream. This would simulate the instream toxicity potential of the discharge during dry weather.

